Executive Summary

This report describes the results of a research project that was initiated in response to concerns regarding 1) negative affects that jackets might have upon integrity of marine and coastal bridge pilings in Florida and 2) an inability to adequately detect piling damage beneath jackets by visual inspection. The project consisted of three tasks, which were to 1) develop a method for nondestructively characterizing the extent of deterioration of jacketed pilings, 2) perform a condition assessment of a representative sampling of jacketed pilings upon Florida bridges, and 3) develop a deterioration model for jacketed pilings The results from the second and third of these three tasks are addressed here, and a final report pertaining to task 1 is to be issued on August 15, 1998.

The inspection program (Task 2) was based upon 18 of 279 bridges throughout the State for which pilings are jacketed, with various relevant data for these being identified from the Bridge Inventory Database. Each of these bridges was visited, and a visual condition assessment of randomly selected jacketed pilings was conducted. This was followed by removal of a portion of these jackets and characterization of any underlying corrosion induced pile damage. The pre- and post-inspection conditions that were encountered were quantified in terms of a Numerical Condition Rating (NCR) value, with the difference between the two values being taken as a measure of the extent to which piling damage was obscured by the jacket. Two of the bridges examined exhibited no corrosion induced damage. In both cases, the jackets had been applied to pilings that were apparently sound (few or no cracks and no spalling). Pilings on five of the remaining bridges contained conventional reinforcement, and the remainder were prestressed. The evaluation results indicated that damage to the jacketed prestressed pilings was more advanced than for the conventionally reinforced ones and that a condition of severe deterioration, concealed or otherwise, can arise upon these. This occurs, first, because the tendon cross section is smaller than for conventional reinforcement and, second; because the cross section of individual tendon wires has a greater ratio of ‘exposed surface area to thickness. Also, visual inspections cannot be relied upon to detect and characterize ongoing corrosion induced piling deterioration beneath an in-place jacket. These trends are quantified in terms of the NCR parameter.

It is projected that the corrosion process that transpires upon jacketed pilings varies depending upon the piling condition at the time of jacket application with the worst case arising when a concrete spall which exposes the reinforcement is present at the time of jacketing. In this case, application of a mortar or concrete filled jacket establishes a corrosion cell between the repaired and unrepaired areas; and rapid attack of the steel in the original concrete adjacent to the fill material occurs which can cause additional delamination and sever tendons in three years or less.

Two recommendations resulted from this project. The first is that a high priority be assigned to inspection of jacketed pilings upon 55 State bridges that were identified as being in either a critical, serious, or poor condition based upon a derated NCR protocol that was developed. Second, the State should abandon pile jacketing as a corrosion control/rehabilitation method.